



## New reports of *Daldinia* species from Kolhapur and Raigad Districts (M.S.), India

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### Abstract

Genus *Daldinia* Ces. & De Not. Belongs to family Xylariaceae. Present paper describes ten species of *Daldinia* viz. *D. "bakeri"* taxon *B sensu* Dennis, *D. concentrica* (Bolton) Ces. & De Not., *D. cupra* Starback, *D. dennissii* var. *microspora* Wollw. & M. Stadler, *D. palmensis* M. Stadler, Wollw. & Tichy, *D. petriniae* Y. M. Ju, J. D. Rogers and F. San Martin, *D. raimundi* M. Stadler, Venturella & Wollw., *D. theissenii* Laessoe, J. Fourn. & M. Stadler, *D. bakeri* Lloyd, *D. loculata* (Lev.) Sacc. Collected from Kolhapur and Raigad Districts of Maharashtra State, India.

**Key words:** *Daldinia*; Mycotaxonomy; Xylariaceae.

### 1. Introduction

Kolhapur and Raigad districts, a part of Western Ghats of Maharashtra, with ever green dense forests, are favourable habitat for many fungi. Genus *Daldinia* was erected by Italian mycologists, Cesati and De Notaris (1863) in honour of Agostino Daldini. (Ju, Rogers & Martin, 1997). Distinctive character of Genus *Daldinia* is the globular shape and zonate arrangement of stroma, with alternative white or pale pithy layers, alternating with narrow black carbonous layers. The zones show different texture and colours. Genus *Daldinia* is represented in India by 07 species till date (Jamaluddin, et.al. 2004). Of the ten species described in the present work, only two species have been previously reported from India, but from different localities. Remaining 08 species make a new record to the fungi of India.

### 2. Material and Methods

Fresh material was collected during rainy season and preserved by drying in oven. Detail structures and microphotography was done using research microscope and routine laboratory techniques. Perispore dehiscence was tested with 10% KOH. Stromatal extractable pigments were studied using 10% KOH and correct identification was done using A mycological colour chart (Rayner 1970). Photography was done using Nikon digital camera. Specimens were deposited in Herbarium Cryptogamae Indiae Orientalis (HCIO) New Delhi, India and accession numbers obtained. SEM was carried out at Physics Department, Savitribai Phule Pune University, Pune (M.S.), India.

### 3. Result

#### 3.1. *Daldinia "bakeri"* taxon *B sensu* Dennis

Text Plate I: 1a -1d, Plate I: 1a-1b

Stroma turbinate (Cube like), sub-sessile, with perithecial outline exposed but deeply wrinkled due to drastic drying, with a deep median furrow, 1.7 - 2 x 1.2 - 1.7 x 0.4 - 0.7 cm; surface dull reddish brown. granules immediately beneath surface with KOH extractable pigments absent; tissue between perithecia dark brown, pithy tissue base, darker zones dark brown, pithy to woody, 0.2 - 0.5 mm thick, lighter zones golden brown, pithy, solid, 1-1.5 mm, ostioles umbilicate to slightly papillate; asci not seen; ascospores brown to dark brown, ellipsoid, inequilateral with narrowly rounded ends, 12.15 x 5-7.5  $\mu$ m, with straight germ slit; perispore dehiscence in 10% KOH.

Habitat: on dead wood, Rajaram College 16.6862° N, 74.2568° E, Kolhapur (M.S.), 26. 7. 2012, HCIO No. 52010.

This species is known only from Central Africa (Stadler, et.al, 2014). It is a new report to the fungi of India.

#### 3.2. *Daldinia concentrica* (bolton) ces. & de not

Text Plate I: 2a -2d, Plate I: 2a – 2e

≡ *Sphaeria concentrica* Bolton, Hist. Fung. Halifax III: 180. 1789; Bolton: Fr., Syst. Mycol. II: 331. 1823; non Wahlenberg, 1812.

≡ *Peripherostoma concentricum* (Bolton: Fr.) Gray, Nat. Arr. Brit. Pl. I: 513. 1821.

≡ *Stromatosphaeria concentrica* (Bolton: Fr.) Grev., Fl. Edinensis: 355.1824.

≡ *Hypoxylon concentricum* (Bolton: Fr.) Grev., Scot. Crypt. Fl. VI: pl. 324.1828.

≡ *Hemisphaeria concentrica* (Bolton: Fr.) Klotzsch, Acad. Caes. Leop. Nova Acta 19: 241. 1843.

Stroma hemi-spherical to spherical, sessile, rarely sub-stipitate; surface even or frequently cracked into a fine network, 2 - 5 x 1.5 - 3 x 1 - 2 cm, inconspicuous perithecia, outline brown; dull reddish brown granules immediately beneath the surface, with KOH extractable pigment dark purple (36), often rather dilute. Tissue between perithecia greyish brown to brown, pithy to woody, tissue below the perithecia layer composed of alternating zones, dark zones -dark brown, pithy to woody, persistent, 0.5-1mm thick. Perithecia lanceolate, 1 - 2.2 x 0.3 - 0.6 mm. Ostioles slightly papillate. Asci not found. Ascospores brown to dark brown, ellipsoid- inequilateral, with narrow end, 12.5 (75) x 6.5 - 7.5 µm, with straight to slightly sigmoid germ slit, perispore dehiscent in 10% KOH, appearing smooth, showing very faint ridges in SEM.

Habitat: on dead wood, Karanj 21.2149° N, 72.8434° E, Uran Dist. Raigad (M.S.), 16. 08. 2014, HClO No. 52011.

The present species has been report from many parts of India (Jamaluddin, et.al. 2004; Pande,A. 2008).

### 3.3. *Daldinia cuprea starback*

Text Plate I: 3a – 3d, Plate I: 3a – 3f

= *Daldinia granulosa* Speg., Anales Mus. Hist. Nat. Buenos Aires 19: 345. 1909.

Stroma usually cylindrical or sub - clavate, sub - sessile or with stout stipe usually bearing constricted ring, surface is smooth, colour is brown, after age it becomes dull brown or black; size of stroma is 1.9 - 3 x 1.6 - 2 x 0.4 - 1.5 cm; without conspicuous perithecial outline; KOH extractable pigment is Brown Vinaceous (86); tissue between perithecia brown, pithy to woody tissue below perithecia layer composed of alternating zones, darker or zones of brown; asci not found. Ascospores are brown, ellipsoid - inequilateral, with narrowly rounded ends, 12.5 x 6.25 - 7.5 µm with straight germ slit, spore length on convex slide; perispore smooth, dehiscent in 10% KOH; in SEM epispore is smooth.

**Habitat:** on dead wood, Karanj 21.2149° N, 72.8434° E, Uran, Dist. Raigad (M.S.), 16. 08. 2014, HClO No. 52012.

This species is known from south America and Africa (Stadler, et.al, 2014). It is a new report to the fungi of India.

### 3.4. *Daldinia dennissii* var. *microspora* M. stadler&wollw

Text Plate II: 4a- 4d, Plate II: 3a – 3e,

= *Hypoxylon stratosum* Sacc., Syll. Fung. IX, p. 544. 1891.

= *Daldinia stratosa* (Sacc.) Sacc.&Trott., Syll. Fung. XXII, P. 327.1913.

Stromata semi-globose with inconspicuous perithecial outline, 2.5 x 1.5 x 1 cm; often becoming blackish in age, with dull reddish brown colour granules immediately beneath surface, with KOH extractable pigment Violet (32), the tissue between perithecia brown, pithy to woody, tissue below the perithecial layer composed of alternating zones, narrow, darker zones dark brown, ostioles slightly papillate; Asci not found; Ascospores dark brown, ellipsoid inequilateral, with narrowly rounded ends, 10.25 x 7 µm, with germ slit on convex side, perispore dehiscent in 10% KOH, appearing smooth by SEM.

Habitat: on dead wood, Rajaram College 16.6862° N, 74.2568° E, Kolhapur (M.S.), 03. 08. 2012, HClO No. 52013.

This species is known from South Australia, Zealand, Polynesia, South Africa (Stadler, et. al., 2014). It is a new report to the fungi of India.

### 3.5. *Daldinia palmensis* M. stadler, Wollw. & Tichy

Text Plate II: 5a – 5d, Plate II: 5a – 5g

Stomata semi-globose, sessile stromatal surface is brown, blacking with age; size of stroma is 1.9 - 6 x 1.8 - 5 x 1.3 cm; KOH extractable pigment is Vinaceous Purple (101); tissue between perithecia brown and below the perithecial layer composed of alternating zones darker zones is brown, lighter zones gray coloured;

perithecial lanceolate; ostioles papillate; Asci not found; Ascospores brown, ellipsoid- inequilateral; broadly to narrow rounded ends, 10 - 15 x 5 - 7.5 µm, germ slit straight or lightly sigmoid, perispores dehiscent in 10% KOH, appearing smooth by SEM.

Habitat: on dead wood, Pal Devrai, Tal.- Gargoti 16.3174° N, 74.1387° E, Dist Kolhapur (M.S.), 06. 09. 2014, HClO No. 52014.

This species is known from Canary Islands (Stadler, et.al., 2014). It is a new report to the fungi of India.

### 3.6. *Daldinia petriniae*. Y. M. Ju, J. D. Rogers and F. San Martin

Text Plate II: 6a – 6d, Plate III: 6a – 6f

= ? *Daldinia concentrica* f. *confluens* C.G. Lloyd, Mycol. Writings 5, Large Pyrenomycetes: 25, 1919.

Stromata hemi-spherical, sessile or sub-sessile, surface is dark brick coloured, blackening with age; size of stroma is 4 - 1 x 2 - 1 x 0.5 - 1.5 cm; KOH extractable pigment initially Livid Purple (81); tissue between perithecia brown, pithy to woody and below perithecia layer composed of alternating zones, darker zones dark brown, pithy to woody, 0.3 - 0.7 mm thick, lighter zones brown, pithy to woody, perithecia lanceolate, ostioles papillate. Asci not found, Ascospores are brown to dark brown, ellipsoid - inequilateral, with narrowly rounded ends, 12.5 - 15 x 7.5 µm, with straight germ slit, spore length on convex side; perispore dehiscent in 10% KOH, smooth by SEM.

Habitat: on dead wood, Rajaram College 16.6862° N, 74.2568° E, Kolhapur (M.S.), 01. 08. 2015, HClO No. 52015. This species is known from tropical regions of the world (Stadler, et.al., 2014). It is a new report to the fungi of India.

### 3.7. *Daldinia raimundi* M. Stadler, Venturella & Wollw

Text Plate III: 7a – 7d, Plate III: 7a – 7e

Stromata sub-globose, sessile, 4.2 x 3.9 x 1.5 cm, surface purplish brown in young stromata, later becoming dark brown and finally blackening, with inconspicuous perithecial outline; stromatal pigments in KOH Purplish Gray (128), tissue between perithecia brown, pithy to woody and below the perithecial layer composed of alternating zones, darker zones dark brown, pithy to woody, 0.1 - 0.25 mm thick, lighter zones white to greyish brown, becoming pithy to woody, persistent, 0.8-1.5mm thick, asci not found. Ascospores dark brown, 10 - 12.5 x 5 - 7.5 µm; germ slit straight; perispore dehiscent in 10% KOH, smooth by SEM.

**Habitat:** on dead wood, Patgaon 17.32638° N, 74.30306° E, Dist- Kolhapur (M.S.), 06. 09. 2014, HClO No. 52016.

This species is known from South Western Europe and Mediterranean (Stadler, et.al, 2014). It is a new report to the fungi of India.

### 3.8. *Daldinia theissenii* Laessoe, J. Fourn. & M. Stadler

Text Plate III: 8a – 8d, Plate IV: 8a – 8f

Misapplied name = *Daldinia clavata* sensu ju et. al.

Stromata hemispherical to somewhat clavate, sub-sessile, surface is brown in colour; size of stroma is 5.5 x 4 x 2.6 cm; KOH extractable pigment is Vinaceous Purple (101); tissue between perithecia gray and brown, tissue below perithecial layer composed of alternating zones darker zones is dark brown, 0.2 - 0.4, lighter zone is white coloured; asci not found. Ascospores are ellipsoid - inequilateral with broad to less frequently narrow end; 10.5 - 16.25 x 7.5 - 8.75 µm, with perispore dehiscent in 10% KOH, SEM shows conspicuous transverse striations.

**Habitat:** on dead wood, Amba 16.9060284°

N, 73.7440942° E, Tal- Shahuwadi, Dist- Kolhapur (M.S.), 18. 10. 2014, HClO No. 52017.

This species has been reported from South America (Stadler, et.al, 2014). It is a new report to the fungi of India.

### 3.9. *Daldinia bakeri* Lloyd

Text Plate III: 9a – 9c, Plate IV: 9a -9c

Stromata irregular, pulvinate to almost semi-globose, with inconspicuous perithecia; 1.5 x 1.5 x 1.2 cm, surface dark brownish; KOH extractable pigment Dark Livid (80); tissue between perithecia brown, concentric zones white, 0.2 - 0.3 mm thick, lighter zones dull whitish, perithecia lanceolate; ostioles slightly papillate; asci not found; Ascospores dark brown, ellipsoid, slightly inequilateral to equilateral, with broad to rounded end, 15 - 16 x 10 - 12.5  $\mu\text{m}$ , with germ slit; perispore indehiscent in 10% KOH.

**Habitat:** on dead wood, Rajaram College 16.6862° N, 74.2568° E, Kolhapur (M.S.), 15. 09. 2012. HCIO No. 520108.

The present species has been reported from many parts of India (Jamaluddin, et.al. 2004; Pande,A. 2008).

### 3.10. *Daldinia loculata* (Lev.) Sacc

Text Plate IV: 10a – 10c, Plate V: 10a – 10c

= *Sphaeria loculata* Lév., Ann. Sci. Nat. Bot., sér. III, 3: 47. 1845.

Stromata spherical to hemispherical, sessile or nearly so solitary, conspicuous perithecial outlines, 1-1.6 x .8-1 x 0.6 cm; surface brown, blackened in age. KOH extractable pigment is Livid Purple (81), tissue between perithecial layers show alternating zones, darker zones brown in colour, lighter zones greyish brown in colour, perithecia lanceolate, ostioles papillate; asci not found; Ascospores are dark brown in colour, ellipsoid - equilateral to slightly inequilateral, with broadly rounded ends, 11-12 x 6.5  $\mu\text{m}$ , with germ slit, perispore is indehiscent 10% KOH; epispore is smooth in SEM.

**Habitat:** on dead wood, Rajaram College 16.6862° N, 74.2568° E, Kolhapur, 03. 09. 2008. HCIO No. 52019.

This species has been reported from Scandinavia and in North America (Stadler, et.al, 2014). It is a new report to the fungi of India.

## 4. Discussion

Genus *Daldinia* is known by 47 species in the world (Stadler, M., Laessoe T., Fournier J., Decock C., Schmieschek, B., Tichy, H. V. & Persoon, D., 2014). Seven species are known from India (Jamaluddin, et. al. 2004) and two species in Maharashtra (Alka Pande, 2008). After studying and comparing all the taxa, collected during the present work, with the known species they were identified as *D. "bakeri" taxon B sensu* Dennis, *D. cuprea* Starback, *D. dennisii* var. *microspora* M. Stadler & Wollw., *D. loculata* (Lev.) Sacc., *D. palmensis* M. Stadler, Wollw. And Tichy, *D. petriniae* Y.M. Ju, J. D. Rogers and F. San Martin, *D. raimundi* M. Stadler, Venturella and Wollw. and *D. theissenii* Laessoe, J. Fourn. and M. Stadler. Eight species have been reported for the first time from India and two species viz. *D. concentrica* (Bolton) Ces. & De Not. and *Daldinia bakeri* Lloyd have been reported for the first time from the study area.

## 5. Acknowledgement

I would like to acknowledge the help of Dr. B. T. Dangat, Ms. Reshma Nagarakatti, Ms. Madhuri Kamble, Ms. Sunita Patil, Mr. Suraj Patil, Mr. Sushant Kirmite, Mr. Ramprasad Narewadi, Mr. Pandurang Bagam and Mr. Yogesh Patil during the field work.

**Table 1:** *Daldinia* Spp. with Dehiscent Spores

Species	Ascospores	Stromatal Pigment
1 <i>Daldinia "bakeri" taxon B sensu</i>	12.15 x 5-7.5 $\mu\text{m}$	No colour
2 <i>D. concentrica</i>	12.5 (75) x 6.5-7.5 $\mu\text{m}$	Dark purple (36)
3 <i>D. cupra</i>	12.5 x 6.25-7.5 $\mu\text{m}$	Brown Vinaceous (86)
4 <i>D. dennisii</i> var. <i>microspora</i>	10.25 x 7 $\mu\text{m}$	Violet (32)
5 <i>D. palmensis</i>	10-15 x 5-7.5 $\mu\text{m}$	Vinaceous Purple (101)
6 <i>D. petriniae</i>	12.5-15 x 7.5 $\mu\text{m}$	Livid Purple (81)
7 <i>D. raimundi</i>	10-12.5 x 5-7.5 $\mu\text{m}$	Purplish Gray (128)
8 <i>D. theissenii</i>	10.5-16.25 x 7.5-8.75 $\mu\text{m}$	Vinaceous Purple (101)

**Table 2:** *Daldinia* Spp. with Indehiscent Spores

Species	Ascospores	Stromatal Pigment
9 <i>D. bakeri</i>	15-16 x 10-12.5 $\mu\text{m}$	Dark Livid (80)
10 <i>D. loculata</i>	11-12 x 6.5 $\mu\text{m}$	Livid Purple (81),

## Text Plate No. I

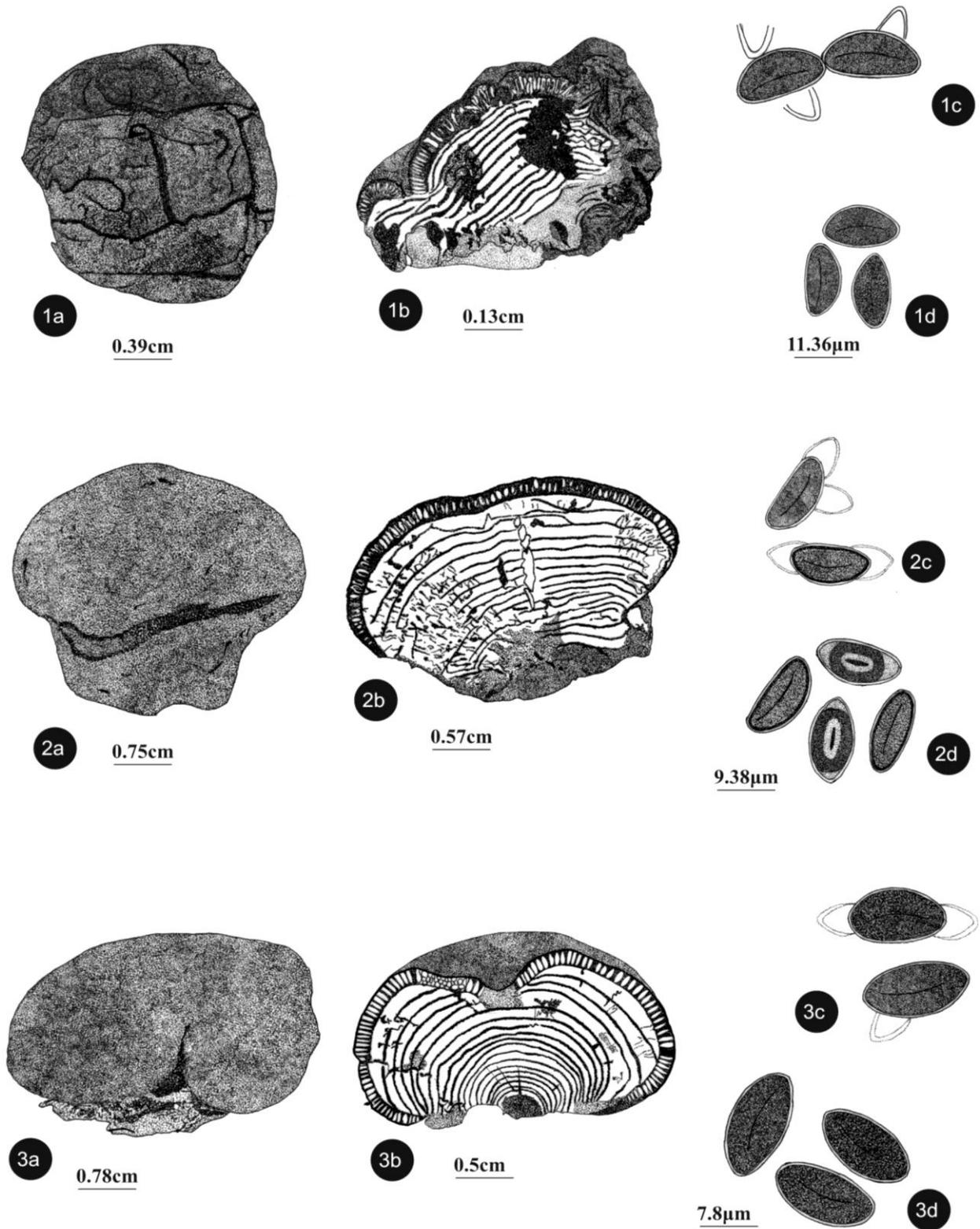


Figure no. a – Habit; b- Section of stroma and c – d- Ascospores of,

Fig.1 : *Daldinia "bakeri"* taxon B sensu Dennis

Fig.2 : *Daldinia concentrica* (Bolton) Ces. & De Not

Fig.3 : *Daldinia cuprea* Starback

### Text Plate No. II

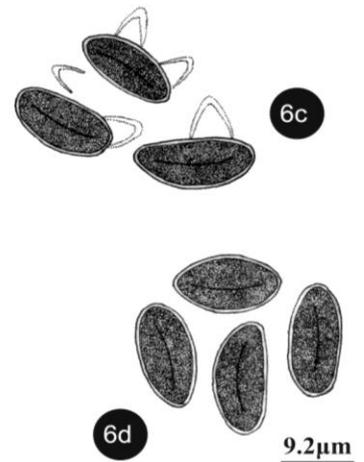
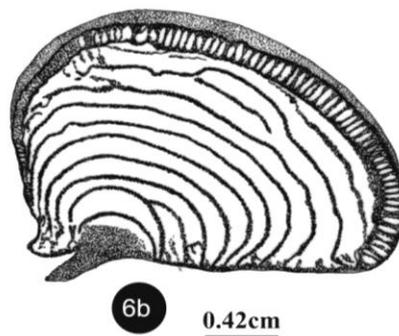
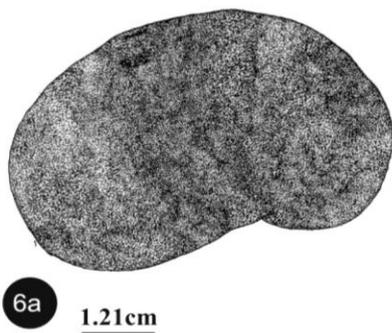
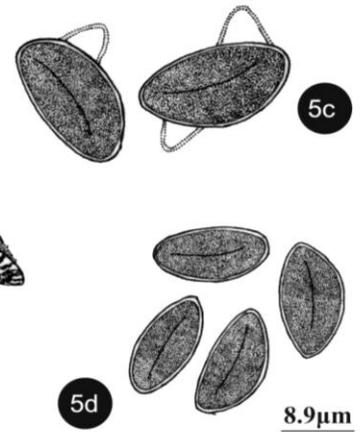
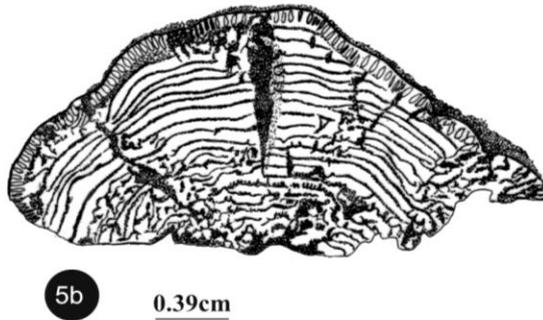
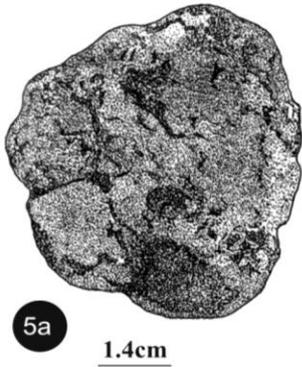
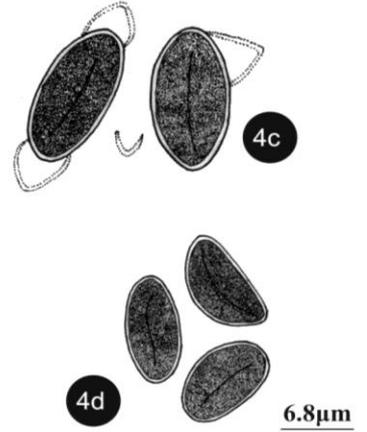
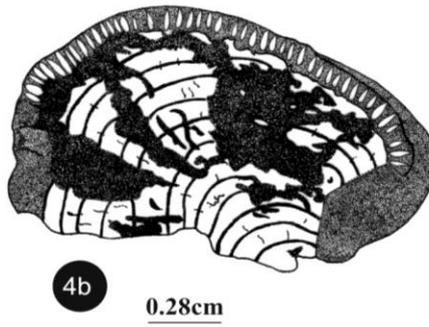
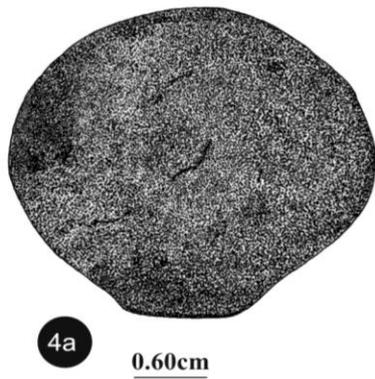


Figure no. a – Habit; b- Section of stroma and c – d- Ascospores of,  
Fig.4 : *Daldinia dennisii* var. *microspora* Wollw & M. Stadler.  
Fig.5 : *Daldinia palmensis* M. Stadler, Wollw. & Tichy  
Fig.6 : *Daldinia petriniae* Y.M.Ju, J.D.Rogers and F. San Martin

**Text Plate No. III**

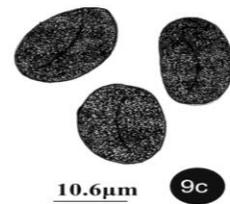
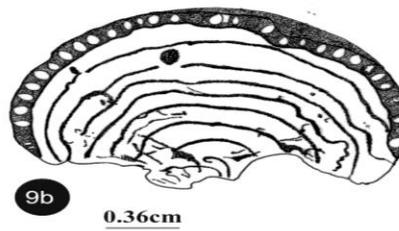
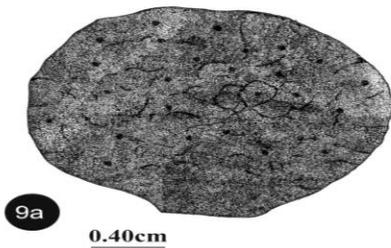
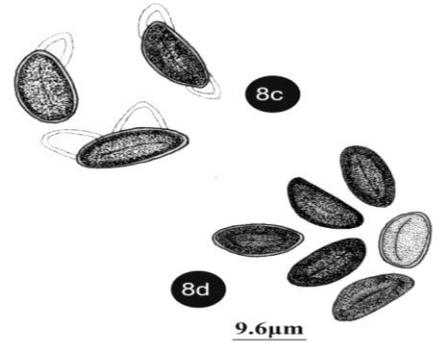
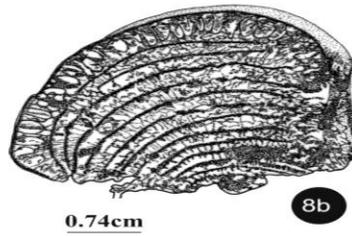
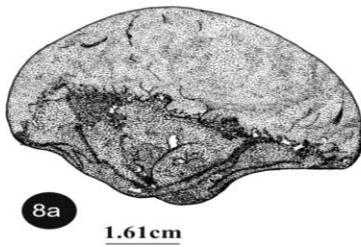
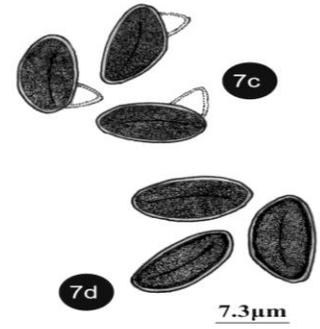
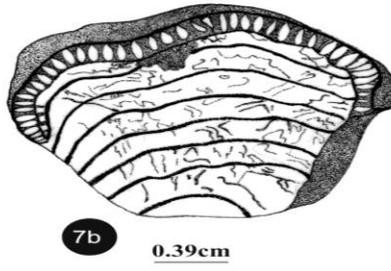
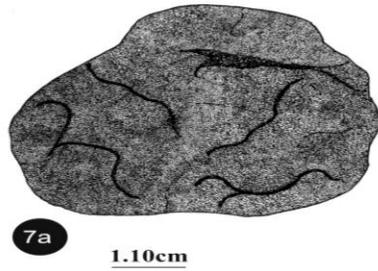


Figure no. a – Habit; b- Section of stroma and c – d- Ascospores of,  
 Fig.7 : *Daldinia raimundi* M. Stadler, Venturella & Wollw  
 Fig.8 : *Daldinia theissenii* Læssøe, J. Fourn. & M. Stadler  
 Fig.9 : *Daldinia bakeri* Lloyd

**Text Plate No. IV**

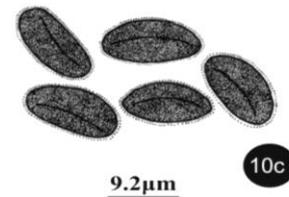
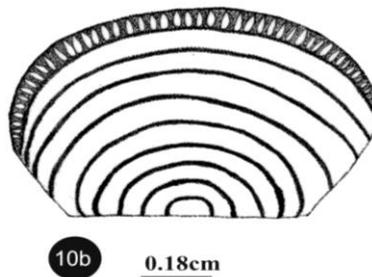
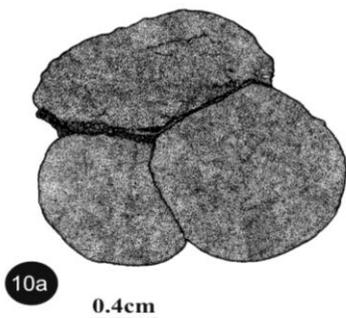
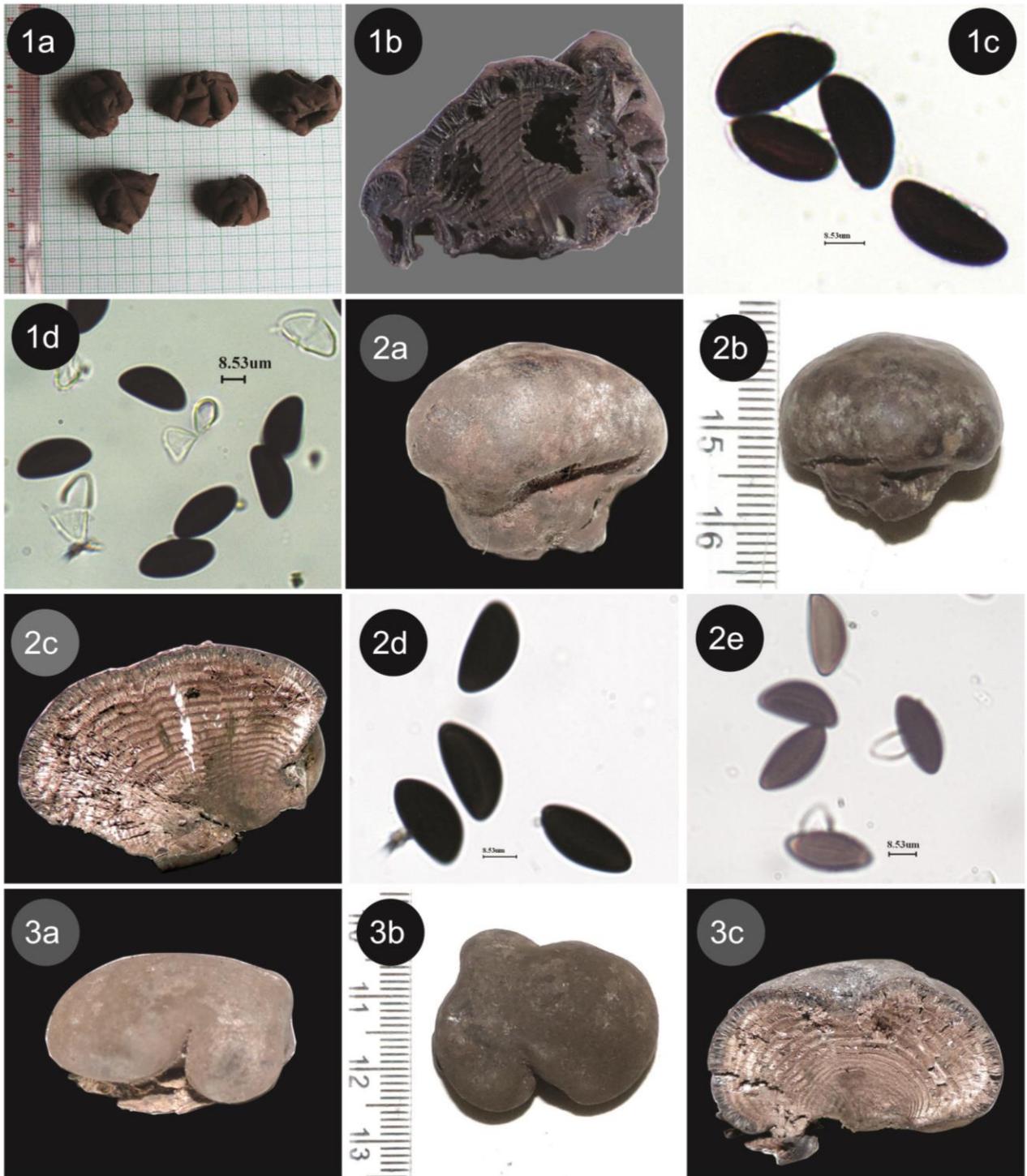


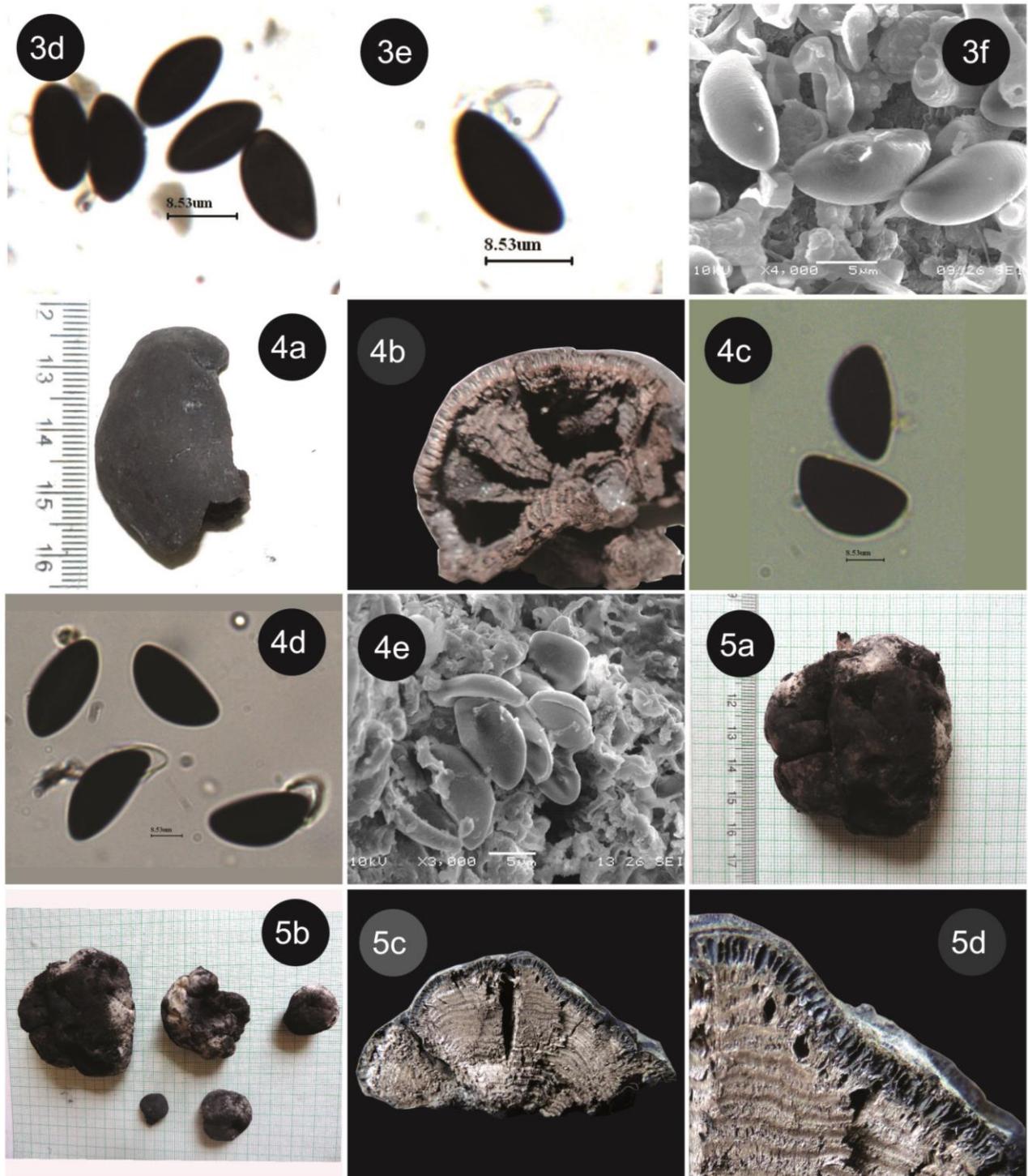
Figure no. a – Habit; b- Section of stroma and c - Ascospores of,  
 Fig.10 : *Daldinia. loculata* (Lév.) sacc

Plate No. I



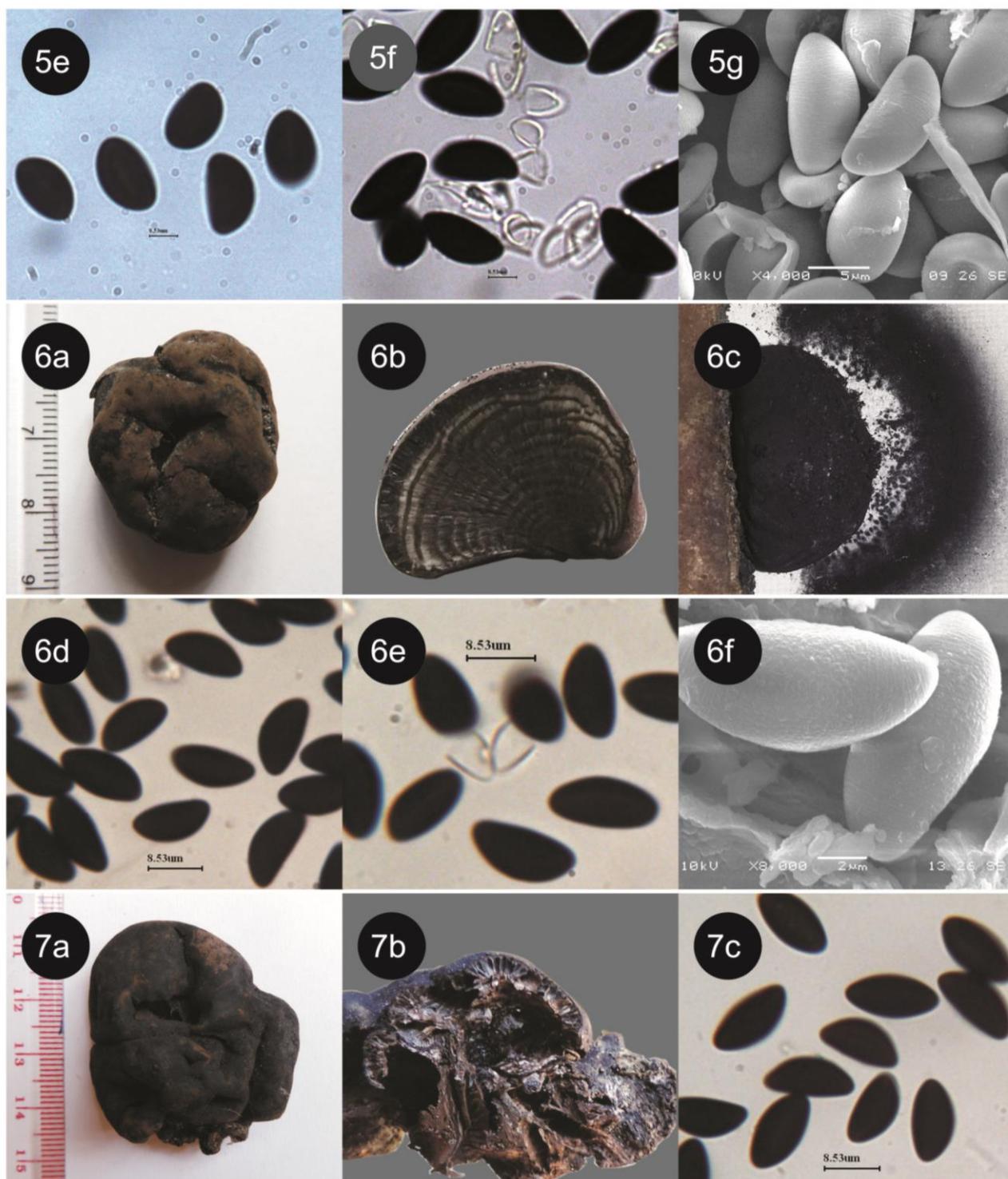
1a-d: *Daldinia "bakeri"* taxon *B sensu* Dennis- a.Habit; b. section of stroma; c-d. dehiscent ascospores., 2a-e: *Daldinia concentrica* (Bolton) Ces. & De Not ; a-b.Habit; c. section of stroma; d-e. dehiscent ascospores., 3a-f: *Daldinia cuprea* Starback a-b.Habit; c. section of stroma;

## Plate No. II



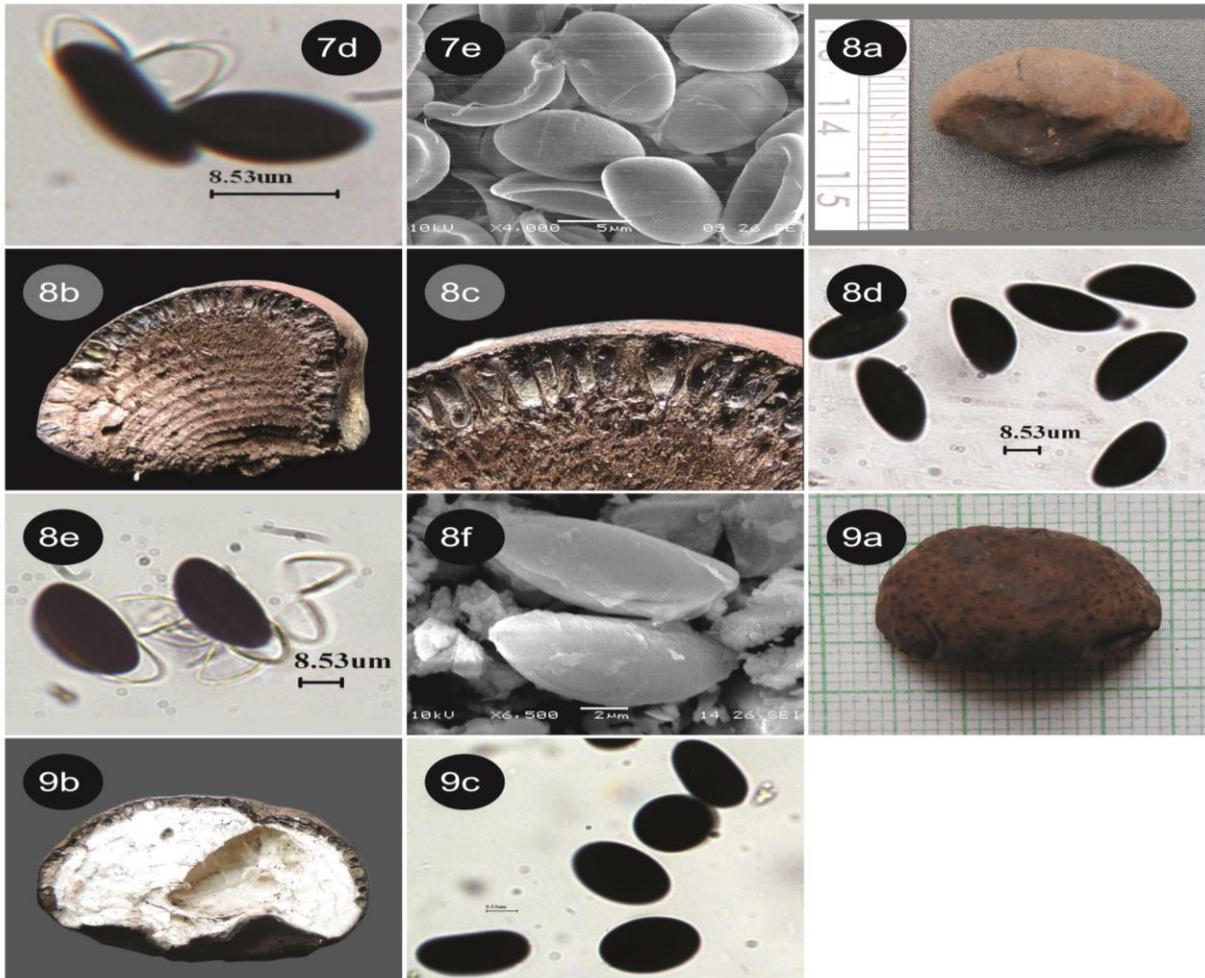
d-e. dehiscent ascospores; f. SEM ascospores., 4a-e: *Daldinia dennissii* var. *microspora* M. Stadler & Wollw. a.Habit;b. section of stroma; c-d. dehiscent ascospores; e. SEM ascospores.5a-g : *Daldinia palmensis* M. Stadler, Wollw. & Tichy a-b. Habit; c-d.section of stroma and Perithecia;

## Plate No. III



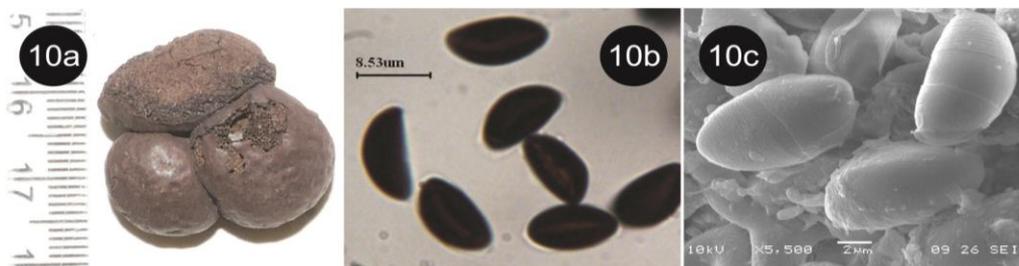
e-f. dehiscent ascospores; g. SEM ascospores. 6a-f : *Daldinia petriniae* Y.M.Ju, J.D.Rogers and F. San Martin a.Habit; b. Section of stroma; c.Sporulation; d-e dehiscent ascospores; f. SEM ascospores. 7a-e : *Daldinia raimundi* M. Stadler, Venturella & Wollw a.Habit; b.section of stroma; c-d. Dehiscent ascospores;

## Plate No. IV



e. SEM ascospores. 8a-f : *Daldinia theissenii* Læssøe, J. Fourn. & M. Stadler  
 a.Habit; b-c. Section of stroma and perithecia;d-e. Dehiscent ascospores; f. SEM ascospores.  
 9a-c : *Daldinia bakeri* Lloyd; a. Habit; b. Section of stroma; c. Ascospores;

## Plate No. V



10a-c : *Daldinia. loculata* (Lév.) sacc a. Habit; b.Ascospores; c.SEM ascospores.

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